

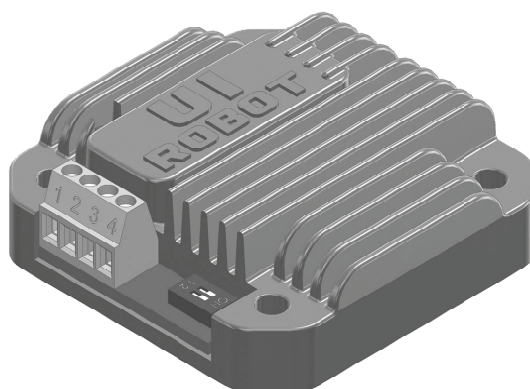


# User Manual

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UIM24204 / UIM24208

Miniature Stepper Motor Controller  
with CAN Bus





# **UIM24204 / UIM24208**

## **Miniature Stepper Motor Controller with CAN Bus**

### **Features**

#### **Miniature Integral Design**

- Miniature size 42.3mm\*42.3mm\*13.5mm
- Fit onto motors seamlessly
- Die-cast aluminum enclosure, improving heat transfer and durability

#### **Embedded DSP Microprocessor**

- Embedded 16-bit high-performance digital signal micro processor
- Simple structured, intuitive, rich instructions
- Intelligent, fault-tolerating, user-friendly interface

#### **CAN2.0B Active Communication**

- 2-wire interface
- 1 Mega bit/sec operation, long distance
- High noise immunity due to differential bus implementation

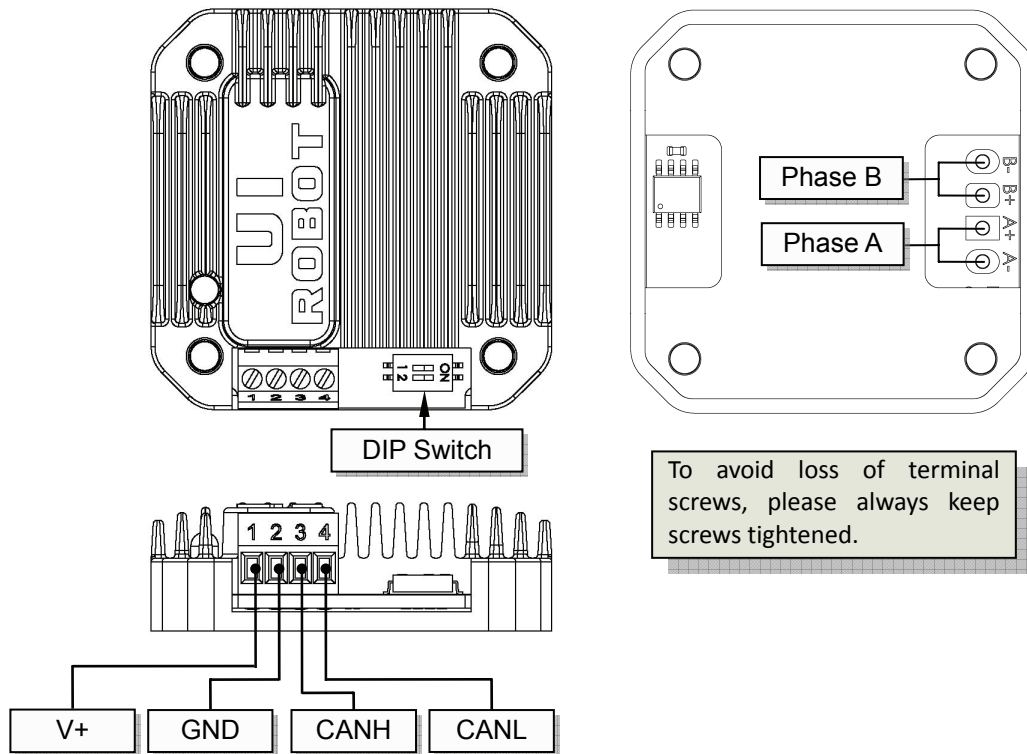
#### **Motor Drive Characteristics**

- Wide supply voltage range 12 ~ 40VDC
- Output current 4A/8A, real-time adjustable through instruction
- Automatic current reduction, real-time set through instruction
- Full to 16th micro step resolution
- Dual full H-bridge with PWM constant current control

### **Description**

UIM24204 and UIM24208 are miniature stepper motor controllers with CAN network capability. Through one CAN-RS232 converter (i.e. UIM25001), user device can command multiple UIM240xx controllers through RS232 port using ASCII coded instructions with minor or no knowledge about the stepper motor driving and CAN network. Instructions are simple, intuitive and fault-tolerating. UIM242xx controller can be mounted onto 42 / 57 / 86 / 110 series stepper motors seamlessly using corresponding flanges. Thickness of the controller is less than 14 millimeter. Enclosure is made of die-cast aluminum providing a rugged durable protection and improves the heat dissipation.

## Terminal Description



## Screw Terminals

| Terminal No. / Color | Name | Description                | MIN | NOM | MAX | UNIT |
|----------------------|------|----------------------------|-----|-----|-----|------|
| 1 / Red              | V+   | Supply voltage             | 12  |     | 40  | VDC  |
| 2 / Black            | GND  | Supply voltage ground      |     | 0   |     | VDC  |
| 3 / White            | CANH | CAN High-Level Voltage I/O |     |     |     |      |
| 4 / Green            | CANL | CAN Low-Level Voltage I/O  |     |     |     |      |

## Motor Wiring Pads

**Pad A + / A-** (at the bottom of the controller): Connect to stepper motor phase A

**Pad B + / B-** (at the bottom of the controller): Connect to stepper motor phase B

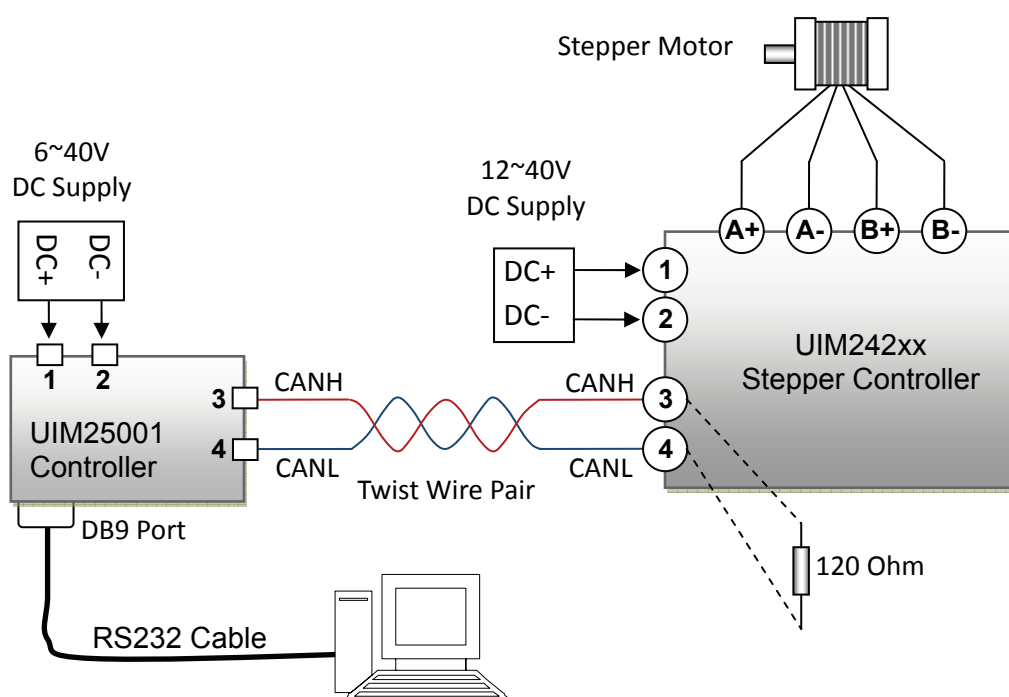


Note: To avoid damaging the controller, make sure the phase winds are connected correctly. Resistance between leads of different phases is usually  $> 100K\Omega$ . Resistance between leads of the same phase is usually  $< 100\Omega$ .

## Typical Applications

### Standalone Operation

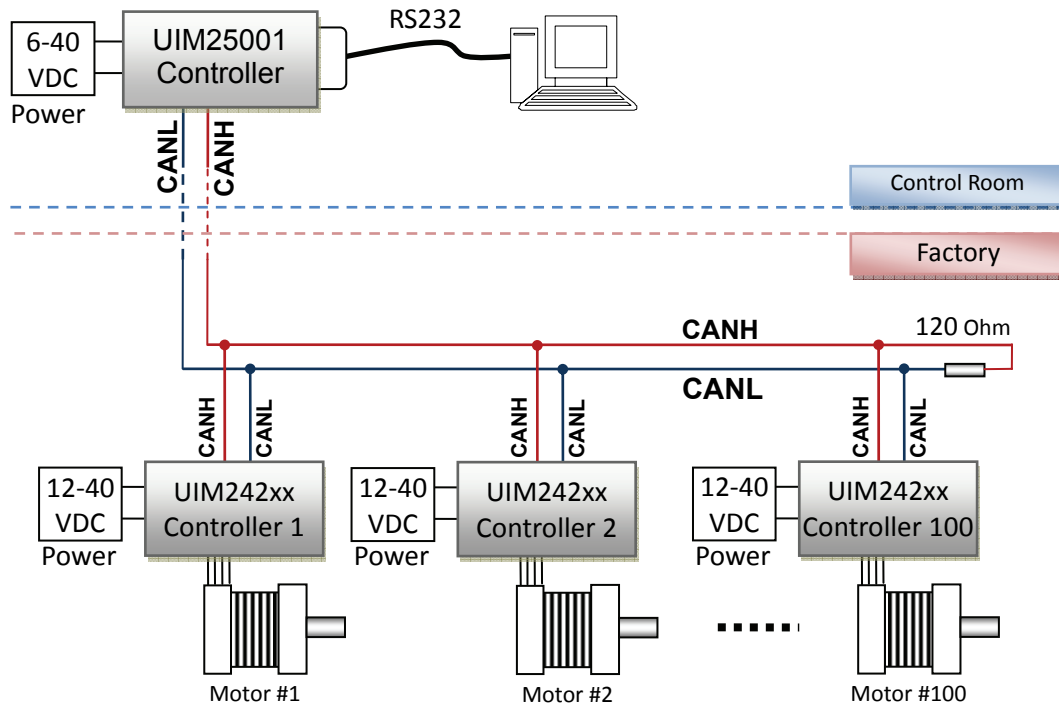
UIM242xx controllers can work in a network as well as standalone. When working standalone, there is only one RS232/CAN converter linked with one UIM242xx controller. In this case, user can use wiring scheme as shown below.



Note: For long distance transfer, the two ends of the bus should be terminated with  $120\Omega$  terminating resistors. UIM25001 converter has a build-in terminating resistor. User only needs to attach a resistor at the other end of the bus. To enable the UIM25001 converter's terminating resistor, see the UIM25001 manual. To achieve the best communication performance, CANH and CANL should use a twisted pair.

## Network Operation

Multiple UIM242xx controllers can be wired together to form a reliable local network. Following figure provides a typical network wiring solution. Detailed terminal wiring on each controller can be found in previous “standalone Operation” solution.



Note: In multi-node CAN applications, it is important to maintain a direct point-to-point wiring scheme. A single pair of wires should connect each element of the CAN bus, and the two ends of the bus should be terminated with 120Ω resistors. A star configuration should never be used. UIM25001 converter has a build-in terminal resistor. User needs to attach a resistor at the other end of the bus. To enable the UIM25001 converter's terminating resistor, see the UIM25001 manual.

Any deviation from the point-to-point wiring scheme creates a stub. The high-speed edge of the CAN data on a stub can create reflections back down the bus. These reflections can cause data errors by eroding the noise margin of the system. Although stubs are unavoidable in a multi-node system, care should be taken to keep these stubs as small as possible.

## Characteristics

### Absolute Maximum Ratings

|                     |                |
|---------------------|----------------|
| Supply Voltage      | 40VDC          |
| Store Temperature   | -40°C ~ +125°C |
| Working Temperature | -20°C ~ +85°C  |

Working under environment exceeding maximum value could damage the controller

### Electrical Characteristics (Ambient Temperature 25°C)

|                       |                                                         |
|-----------------------|---------------------------------------------------------|
| Supply Power Voltage  | 10V ~ 40VDC                                             |
| Motor Output Current  | Max 2A/4A/8A per phase (Adjustable through instruction) |
| Driving Mode          | PWM constant current                                    |
| Stepping Resolution   | full-step, half-step, quarter-step, and sixteenth-step  |
| Insulation Resistance | >100MΩ                                                  |
| Dielectric Strength   | 0.5KV in one minute                                     |

### Communication (Ambient Temperature 25°C)

|               |                                                                                                                                                                                                                            |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Protocol      | Active CAN 2.0B                                                                                                                                                                                                            |
| Wiring method | 2-wire, CANH、CANL                                                                                                                                                                                                          |
| CAN bus drive | <ul style="list-style-type: none"><li>• Supports 1 Mb/s operation</li><li>• ISO-11898 standard physical layer requirements</li><li>• Suitable for 12V and 24V systems</li><li>• Up to 100 nodes can be connected</li></ul> |

### Environment Requirements

|                     |             |                                          |
|---------------------|-------------|------------------------------------------|
| Cooling             |             | Free Air                                 |
| Working Environment | Environment | Avoid dust, oil mist and corrosive gases |
|                     | Temperature | -20 °C ~+ 85 °C                          |
|                     | Humidity    | <80%RH, n condensation, no frosting      |
|                     | Vibration   | 3G Max                                   |
| Storage Temperature |             | -40 °C ~+ 125 °C                         |

### Size and Weight

|       |                                  |
|-------|----------------------------------|
| Size  | 42.3mm x 42.3mm x 13.5mm (L*W*H) |
| Wight | 0.1 kg                           |

### Overview

UIM24204 and UIM24208 are miniature stepper motor controllers with CAN2.0B Active bus communication capability. They can work in a network as well as standalone. Their embedded 16-bit microprocessor supports hardware digital signal processing. The CAN2.0B based communication features high-speed (1Mega bps), long distance (max 10,000 m), and high noise immunity. It is widely used in automobile/automated manufacturing/transportation management, where high reliability is critical. The physical wiring of a CAN bus network requires only one pair of wires (twisted).

By linking several controllers together through the CAN bus, user can control multiple motors in a real-time fashion. To communicate with these motor controllers, user needs a CAN-RS232 converter (i.e. UIM25001 Converting Controller). The UIM25001 commands the UIM242xx controllers through CAN bus and communicates with the user devices through RS232 ASCII coded instructions. In that manner, user can operate these controllers with minor or no knowledge about the stepper motor driving and CAN protocol. Instructions are simple, intuitive and fault-tolerating. For example, to command a speed = 1000 steps/sec, following instructions are all valid:

"SPD = 1000;" or "SPD: 1000;" or "SPD 1000;" or "SPD1000;" or "SPD %?&%\* 1000;"

If in any case, a wrong instruction is received, the controller will return an error message. Incorrect instructions will be discarded without execution to prevent accidents.

UI Robot Co. provides free Microsoft Windows XP based VB / VC demo software and corresponding source code, to facilitate the quick start of user device side programming.

UIM24204 and UIM24208 are capable of providing 1.5~4A and 3 ~ 8A adjustable output current. Output current can be adjusted through instruction in a real time fashion. Once set, the value is stored in the onboard non-volatile memory. The controller also has high-speed current compensation to facilitate the motor's high speed performance. This series of controller takes 12 ~ 40VDC power supply.

UIM24204 and UIM24208 are designed to mount onto 42 / 57 / 86 / 110 series stepper motors seamlessly through corresponding flanges. The thickness of these controllers is less than 14 millimeter. The enclosure is made of die-cast aluminum which provides a rugged durable protection and improves the heat dissipation.

Packing includes 4 screws and thermal compound.

### Communication with UIM242xx

In order to operate the UIM242xx controller, a CAN-RS232 Converting Controller (UIM25001) is required between the user device and the UIM242xx controller.

User device sends ASCII coded instructions through RS232 port to the UIM25001 controller. Inside UIM25001, the RS232 based instructions are translated into CAN messages and sent to UIM242xx controllers. ACK and/or feedback messages are sent back from UIM242xx controller to UIM25001 and then translated into RS232 messages, and sent to user device.

Through this fashion, users do not have to understand and deal with CAN bus operations while enjoy the advantages of CAN bus, such as high speed, long distance, interference immunity, network, and easy wiring.

For detailed instructions and operations on the communication between user device and UIM25001, please refer to the UIM25001 converter's user manual.

### Use the Motor Control Functions

#### Input Supply Voltage

UIM242xx series controllers are featured with a wide range of input supply voltage from 12 to 40VDC. In general, higher supply voltage improves motor performance under high speed situation, but also increases the power loss and temperature. Input voltage provided to the motor and also provided to logic circuits for control and communication.

#### Set Output Current

UIM24204 and UIM24208 are capable of providing 1.5~4A and 3~8A adjustable phase current respectively. User can adjust the output current in real-time using the CUR instruction. For details about the CUR instruction, please refer to UIM25001 converting Controller's User Manual.

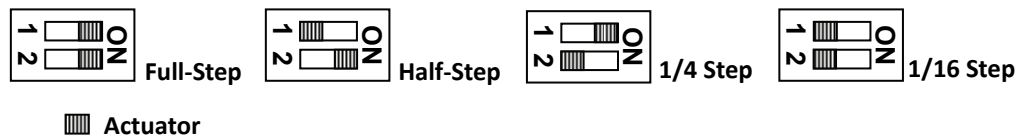
#### Enable/Disable Automatic Current Reduction

To reduce the power consumption and temperature raise, UIM242xx controller has the build-in function to reduce output current by half, 0.5 seconds after the motor stopped. User can enable/disable this function in real-time using the ACR instruction. Caution has to be taken before enable this function, since current reduction also means holding torque reduction. For details about the ACR instruction, please refer to UIM25001 converting Controller's User Manual.

#### Set Micro Step Resolution

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UIM240xx controller can provide complete micro-stepping control at full-step, half-step, quarter-step, and sixteenth-step resolutions. Only during power up, the DIP setting is read as the initial value of micro step resolution. After that, the DIP value has no effect. The micro step resolution need be changed through following instruction.



User can adjust the Micro Step Resolution in real-time using the MCS instruction. For details about the MCS instruction, please refer to UIM25001 converting Controller's User Manual.

### **Set Desired Motor Speed**

Speed is defined as how many steps per second, PPS (Pulses per Second) or Hz. User can adjust the motor speed in real-time using the SPD instruction. For details about the SPD instruction, please refer to UIM25001 converting Controller's User Manual.

### **Set Desired Motor Direction**

User can adjust the motor running direction in real-time using the DIR instruction. For details about the DIR instruction, please refer to UIM25001 converting Controller's User Manual.

### **Set Desired Relative Displacement**

User can set the desired steps or micro steps (if MCS≠1) beyond current motor position in real-time using the STP instruction. Once the motor hits the commanded relative displacement, it will stop. For details about the STP instruction, please refer to UIM25001 converting Controller's User Manual.

### **Enable the Motor Driver**

User can enable the stepper motor driver (i.e. H-bridge driving circuit) in real-time using the ENABLE instruction. For details about the ENABLE instruction, please refer to UIM25001 converting Controller's User Manual.

### **Disable the Motor Driver**

User can disable the stepper motor driver (i.e. H-bridge driving circuit) in real-time using the OFFLINE instruction. Once an OFFLINE instruction is executed, the motor has no power supply, the power consumption is cut to minimum (the logic circuit is still working). User needs to use the ENABLE instruction to turn the motor driver back to working. For details about the OFFLINE instruction, please refer to UIM25001

### **General ACK (acknowledgement) Message**

After receiving an instruction, the controller will immediately return an ACK message of all current desired settings including the most current setting. Specifically, the following information is included in the ACK message: STP, SPD, DIR, MCS, CUR, ENABLE/OFFLINE, and ACR.

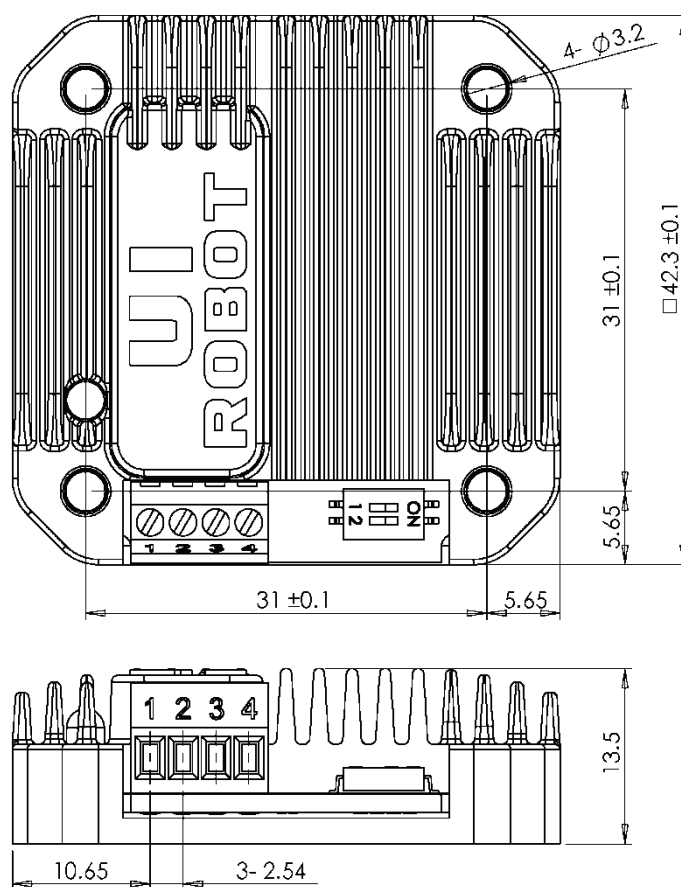
For details about the ACK message, please refer to UIM25001 converting Controller's User Manual.

### **Motor Status Feedback Message**

Motor's current working status can be obtained by using the FBK instruction. Once received, the controller will send back the feedback message comprising following up-to-date information: displacement/steps, speed, direction, micro step resolution, current, enabled / offline status, and ACR status. For details about the FBK instruction, please refer to UIM25001 converting Controller's User Manual.

## Dimension

Unit: mm



## Installation of UIM242xx Controller

